GRATTAN Institute

Renewable Hydrogen Target for electricity generation in the South-West Interconnected System

Response to consultation paper

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Overview

The West Australian Government is investigating a Renewable Hydrogen Target for electricity generation in the South-West Interconnected System (SWIS), which would introduce an obligation on electricity retailers and potentially large users to purchase a portion of their electricity from hydrogen-fuelled generation. The mission of the Renewable Hydrogen Strategy is to underwrite domestic demand for renewable hydrogen market, which in turn would support growth broader industry growth and development objectives and potentially support development of an export industry.

Underwriting demand as well as stimulating supply are key elements of 21st century industry policy, as explored in our recent report, *The Next Industrial Revolution*. Doing both provides an appropriate balance of risk sharing between the private and public sectors. It is a good way to grow and develop a new industry.

However, without clear end goals and good analysis of the underpinning economic fundamentals of the new industry, such an approach risks wasting public and private capital, and locking the economy into sub-optimal activity at the expense of other sectors. These steps are missing in the current Consultation Paper.

The West Australian Government should pause its investigation of a renewable hydrogen target. Instead it should conduct a thorough examination of the comparative advantages that WA has in a net-zero global economy, and how these can be turned into competitive and strategic advantages.

This analysis should recognise that the nature of the role renewable hydrogen could play in exporting renewable energy is very different from its possible role in balancing a high-renewables electricity grid. And any policy for to support the latter should align with the current stage of renewable hydrogen generation technology, particularly in regard to how renewable hydrogen could be supplied in this application.

The government should separately create a roadmap for decarbonising the SWIS. While electrification may be the primary vehicle on that roadmap, there may be a role for renewable hydrogen in industrial applications for which electrification is unsuited.

Only then it should turn to considering the role that hydrogen production and use can play in transitioning WA from being one of the more carbon intense state economies in Australia to one of the least. This may involve a renewable hydrogen target or it may involve another scheme to underpin demand for green commodities more generally. Alternatively or as well, it may involve further policy interventions to fully decarbonise the electricity system.

In Part 1 of this submission, we briefly describe relevant background and context, including relevant parts of Grattan Institute's previous reports. In Part 2, we set out why we think the time is not right for a renewable hydrogen target. And in Part 3, we briefly respond to the questions from the issues paper

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1 Background and context

The West Australian hydrogen strategy sets a vision of WA being 'a significant producer, exporter and user of renewable hydrogen'.

> Western Australia will develop industry and markets to be a major exporter of renewable hydrogen. To facilitate the export of renewable hydrogen, Western Australia will develop domestic production capabilities and applications of renewable hydrogen, improving the State's hydrogen industry expertise, contributing to global decarbonisation and decarbonising the State's economy. It will also contribute to improving air quality across the State.[1]

Developing new industries will be key to Australia flourishing in a net-zero global economy. Australia is heavily dependent on exports that cause emissions when produced here, or are inputs for emissions-intensive processes overseas (see fig. 1.1). This must change, and government's approach to industry policy must change to achieve it.

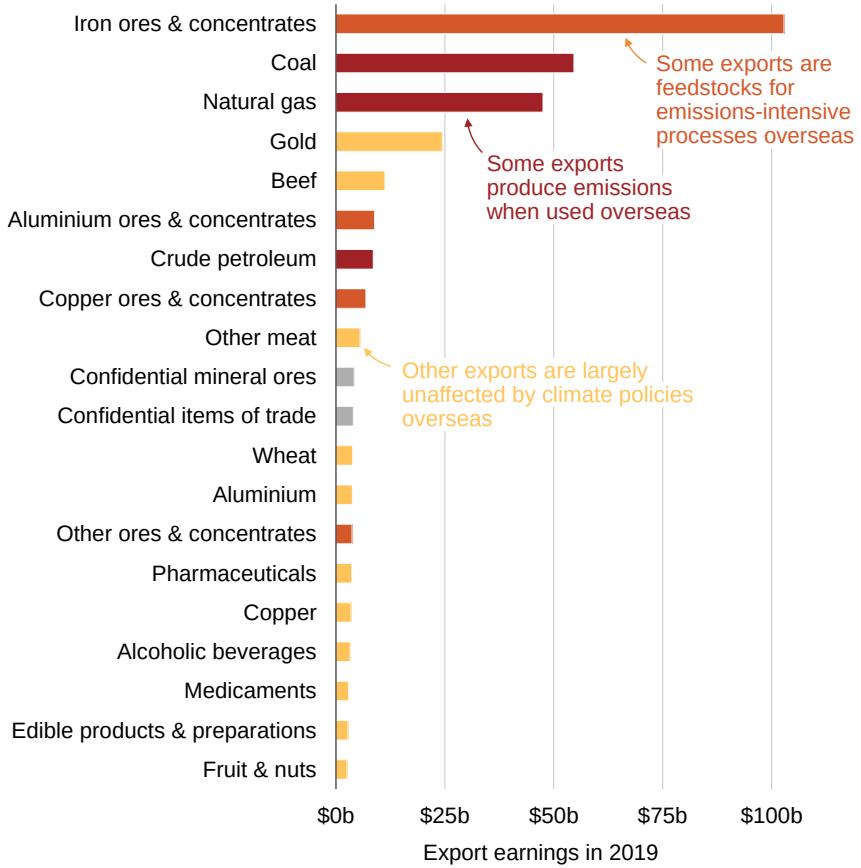
1.1 Hydrogen's role in a net-zero economy

Green hydrogen is considered a potential future export growth commodity, and may play a role in decarbonising heavy industry in Australia too, as an input to decarbonise minerals processing and ammonia and steel production.

The role of hydrogen in the electricity sector is less clear. Our research on the National Electricity Market shows that a 90 per cent renewable grid can be achieved at low cost.[2] The last 10 per cent is much harder,

Figure 1.1: Some of Australia's biggest exports will decline in a net-zero world

Value of goods exports ($ billion 2019)



Notes: Top 20 commodities by value in 2019-20. Descriptions of confidential commodities – shown in grey – are not available.

Source: Grattan analysis of DFAT (2021).

1. Energy Policy WA (2022).
2. Wood and Ha (2021).

and more expensive. If anything, the cost implications may be stronger for Western Australia, given the limited opportunities for long-duration, pumped hydro storage. At the moment, the most economic solution seems to be gas, with the emissions from this offset elsewhere in the economy. It is possible that hydrogen turbines could supplement or replace gas generation for the last 10 per cent. But the economics and logistics (particularly for hydrogen storage) are very uncertain and, at least on the east coast, have been the subject of controversy.

While there has been considerable speculation and even commitments to hydrogen in power generation, no projects, pilot, development or commercial have yet been delivered. This status suggests that a development support policy is more appropriate than one that seeks to deploy proven technologies with the objective of driving down the cost. [3]

1.2 The case for a new approach industry policy

Australia's industrial sector faces transformative change to meet global and domestic emission reduction targets. Our current policies are not up to the task. A 21st Century industry policy to deal with a 21st Century problem can underpin Australia's successful transformation to a world-leading energy superpower.

Governments use industry policy to alter the structure of an economy by encouraging resources to move into sectors that are perceived as desirable for future development.[4]

In the past, industry policy has been used to make markets more efficient, such as by correcting under-investment in research and development. Industry policy has also been used to direct resources to strategically important sectors to promote economic growth. This was the case with the IT transformation in the United States, where the government invested in the internet, GPS, and touchscreen technologies.[5]

To meet long-term emissions reduction targets, Australia's industrial sector must be transformed in fewer than three decades. A 21st Century industry policy is needed.

Industry policy can be controversial, so it is worth making the case for why such a policy is needed in Australia today.

First, markets do not generally provide adequate incentives for research and development of new technologies, because knowledge is often intangible, risky, and difficult to appropriate. Low-emission technologies are particularly complex and uncertain.

Second, many of the technologies that might produce large emissions reductions are expensive and high-risk. Early investors face high costs, low returns, and the risk of competitors free-riding on their initiative. We see this in hydrogen development now. Investors require a reliable, long-term carbon price to underpin their investments. Yet a carbon price is inherently uncertain because it depends on the decisions of governments. For both these reasons, investment in low-emission technologies is and will remain critically inadequate.

And third, there is a time imperative. Market forces are not good at managing structural transformations at high speed when the future is deeply uncertain. Moreover, the long-lived nature of industrial assets means that industry is particularly poorly suited to fast changes.

Australia needs a 21st Century industry policy to address these challenges. A new industry policy can firmly position Australia to capitalise on trade opportunities and boost our economy. Creating new

3. See for example Macdonald-Smith (2022) and Adelaide Advertiser (2022)
4. Aiginger and Rodrik (2019).
5. Mazzucato (2019).

employment and economic opportunities will be important to sustain support among the Australian people for the transition to net zero.

Industry policy requires sustained collaboration between the public and private sectors.[6] Australia has successfully used industry policy in the past. We should learn from that success to set a new strategic direction for the future.

1.2.1 What 21st Century industry policy looks like

Many industry sub-sectors share two common challenges. They currently lack commercially viable abatement pathways. And they face re-investment decisions within the next 30 years that, taken wrongly, could lock in emissions for an extended period.

Australia's industry policy today is a mix of direct grant schemes with poorly articulated objectives and ill-structured scope, and ineffective regulatory policies. Both are routinely open to lobbying by vested interests.

Australia needs an overarching policy framework with consistent, targeted policies linked to clear goals, developed and executed in sustained collaboration with industry. The policy framework needs three key components: policies and programs to stimulate supply of green commodities and products, targeted support for technology-specific market failures, and market-based policies to underpin demand. Each component should be deployed to address each of the three challenges in the right place and at the right time. And, the framework needs to ruthlessly target areas of clear economic advantage. There is no time (or capital) to waste.

6. Australian Industry Energy Transitions Initiative (2022).

2 Why a renewable hydrogen target is the wrong policy (for now)

2.1 WA has not set clear goals and pathways for decarbonisation

The West Australian Government has committed to net-zero emission by 2050 and to close down state-owned coal generation by 2030. But beyond this, there are no clear goals or pathways to decarbonise the state. Without knowing when the state wants to reach net-zero emissions in its electricity system and its industrial sector, it is impossible to sensibly design a hydrogen target, or even to assess whether it is the right tool for the job.

Applied in the wrong way, a renewable hydrogen target for electricity generation could support hydrogen generation at the expense of direct renewable generation. The most likely role for renewable hydrogen generation is to balance a system dominated by intermittent solar and wind generation to maintain reliability. The best approach is to integrate emissions reduction and reliability objectives such that both are met. If this is well-designed, renewable hydrogen generation should follow if it is part of a lowest cost portfolio.

The West Australian Government should pause its investigation of a renewable hydrogen target. Instead it should conduct a thorough examination of the comparative advantages that WA has in a net-zero global economy, and how these can be turned into competitive and strategic advantages. It should also create a roadmap for decarbonising the SWIS.

2.2 It has not been shown to be economic for electricity generation

Hydrogen is currently all things to all people. There are up to 35 identified roles that hydrogen could play in the energy transition: from vehicle fuel to feedstock, shipping to storage.[7] But we are yet to determine where the best economic opportunities for hydrogen in Australia are. It is unlikely we will use hydrogen for everything it can theoretically do.

> Clean hydrogen will have to win its way into the economy, use case by use case. It could do so on its merits, or it could do so because of supportive policy (including carbon prices). But it will have to do so in competition with every other clean technology that could solve the same problem. And that is where the dreams of the hydrogen economy hit reality: in almost all use cases there is a good reason why hydrogen is not currently used - because other solutions are cheaper, simpler, safer or more convenient.[8]

If electricity generation turns out to be a good use for hydrogen in an Australian context, then a renewable hydrogen target would help build capacity in the electricity market to source hydrogen and to build, commission and operate hydrogen turbines. But as yet, the Australian energy market as a whole has no experience in doing so. A mandatory target on an inexperienced market is a recipe for cost overruns, non-compliance, and reputational damage.

A better approach would be to subsidise pilot projects for hydrogen turbines directly so that the industry can better understand the economics, the planning, the logistics, and the operational demands. Then, once those are better known, a mandatory policy would have a chance of succeeding. And if it turns out that hydrogen is a poor prospect, energy consumers will have been shielded from the costs.

7. Liebreich (2021).
8. Ibid.

2.3 Linking the electricity market to global trade is politically risky

If Australia takes one lesson from the war between Russia and Ukraine, it should be this: do not link an electricity market to a globally traded energy commodity. As soon as geopolitical strife hits international energy markets, domestic electricity prices are affected. And consumers pay.

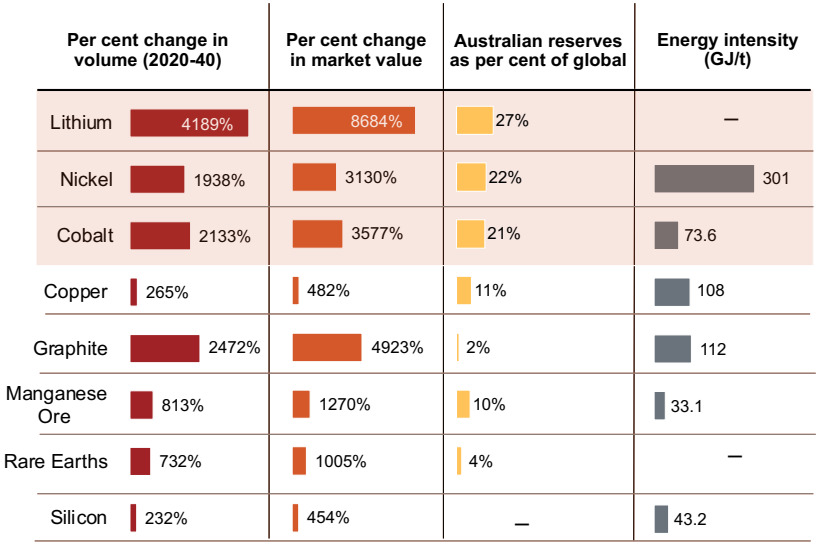
Thanks to its abundant natural gas reserves and gas reservation policy, WA can keep its electricity market isolated from global energy markets. Unless it is prepared (in the future) to have a similar reservation policy for hydrogen, a mandatory target for hydrogen generation is likely to result in higher domestic electricity costs whenever global trade is disrupted.

2.4 It risks holding back development of other industries

Moving up the minerals value chain is a big opportunity for Australia to replace exports like coal and gas that will decline in a net-zero global economy.[9] WA is rich in critical minerals, and the global demand and value of these will increase sharply as the energy transition proceeds (see fig. 2.1). But processing these minerals is energy-intense. Renewable hydrogen may be the best option to ensure these industries move up the value chain in a low- or zero-carbon way.

The same goes for iron ore: our research shows that Australia can capture a significant share of the global iron and steel market by making iron in Australia from our iron ore and our hydrogen, rather than exporting both for others to value-add.[10]

Figure 2.1: Demand for critical energy minerals could fuel the next mining boom



Notes: Energy intensity is the amount of energy required to produce a tonne of refined metal. Energy intensity of rare earths production varies. Energy intensity for lithium varies and the dominant form of production in Australia is more energy-intense than the dominant form of production in competitor countries. Dashes indicate unavailable data.

Source: Grattan analysis of IEA (2021a) (volume), IEA (2021b) (value) Geoscience Australia (2020) (share of global reserves), Surovtseva et al (2022) (energy intensity of graphite), Voet et al (2018) (energy intensity of copper, manganese, and nickel), Dai et al (2018) (energy intensity of cobalt) and Maldonado (2020) (energy intensity of silicon).

9. Wood et al (2022).
10. Wood et al (2020).

Industrial facilities that don't export may also need hydrogen to decarbonise production. Cement production is one example; ammonia and urea production is another.

Skewing domestic hydrogen production towards electricity production through a mandatory target will potentially lock minerals processors and heavy industry out of hydrogen. Hydrogen producers are likely to prefer a guaranteed market, such as a mandatory target provides. And investors will have the same preference.

In *The Next Industrial Revolution*, we explained that a better approach is for governments to put in place targets for green commodities in construction. This would generate demand for green steel, green aluminium, green concrete, green glass, and many other materials. This demand would flow through to demand for hydrogen where hydrogen is the most economic way to 'green' these production processes.

3 Responses to consultation questions

This section responds directly to the questions in the consultation paper.

1. What are some examples of an objective or objectives that could be used to assess the benefits, costs and impacts of a Renewable Hydrogen Target for electricity generation?

The WA Government should assess the costs and benefits of different decarbonisation pathways for the SWIS. This would allow hydrogen for electricity to be compared to other solutions.

2. How might other uses of renewable hydrogen be accommodated under a Renewable Hydrogen Target certificate scheme? How might Government otherwise support and/or encourage other use cases for hydrogen?

As all use cases for hydrogen are still non-commercial, the WA Government should support pilot and demonstration projects for a number of use cases, before considering whether to implement a certificate scheme and who that scheme might apply to.

3. What role do you believe renewable hydrogen can play in the decarbonisation of electricity generation? To what extent will a Renewable Hydrogen Target for electricity generation in the SWIS assist in achieving the decarbonisation objectives of the State Government?

The role of a hydrogen target for electricity generation is not clear, because the WA Government has not articulated its goals for decarbonising the SWIS, beyond coal closure.

4.What role can the infrastructure associated with the production of renewable hydrogen (i.e. renewable electricity generation facilities, electrolysers, transport and storage infrastructure) play in the broader SWIS?

No comment.

5. To the extent you are able please reflect on some of the technical issues, challenges and considerations in the utilisation of hydrogen in the generation of electricity. To what extent can these technical issues and challenges be overcome? How should this impact on the consideration of a Renewable Hydrogen Target for electricity generation in Western Australia?

At the moment, the most prospective use of hydrogen for electricity generation seems to be supplying fast-start flexible capacity in a high-renewables grid. This is similar to the role that gas plays now.

If hydrogen is to play this role, economic hydrogen storage will be critical. Gas, which is always available from pipelines when a generator switches on. Hydrogen will not be.

6. Do you believe a renewable hydrogen electricity generation certificate-based scheme represents an efficient and effective means to deliver a Renewable Hydrogen Target for electricity generation in the SWIS? Please explain your answer.

In general, certificate schemes have proved effective at meeting targets at lowest cost. However, the extent to which they do so depends on competition. In a market like the SWIS, which is dominated by a few power producers, monopsony effects may reduce cost efficiencies.

7. What are some other approaches which could be considered alongside a renewable hydrogen electricity generation certificate scheme that would provide a framework to deliver on the objectives or outcomes sought?

It would be preferable to invest directly into de-risking hydrogen use projects, including electricity generation, before proceeding with a certificate scheme.

8. Is the proposed approach of certification, deemed liability and certificate transfer an efficient and effective way to deliver on the intent of the Renewable Hydrogen Target for electricity generation? Are there alternative approaches which could better deliver on the objectives?

The proposed approach is consistent with other certificate schemes in operation in Australia, including the Renewable Energy Target. However, such schemes are best used to support the deployment phase of proven technologies where the role is clear and the technology is proven but a cost gap exists. This gap may be because there is no explicit emissions reduction or reliability policy or because some scale is necessary to reduce a cost premium for the technology.

9. What are the benefits, costs and impacts of an exemptions regime for a Renewable Hydrogen Target for electricity generation?

Exemptions tend to drive up the cost impact of achieving the target on those who are not exempt. In this case, ordinary consumers would pay higher costs if exemptions were in place.

The purpose of exemptions for energy-intensive and trade-exposed businesses is to prevent carbon leakage: goods currently produced in Australia shifting to being produced offshore in jurisdictions with higher emissions intensity of production. This can happen because Australian exporters compete with other exporters that do not face a carbon price in their home country. And it can happen because Australian producers face competition from importers who do not face a carbon price in their home country.

Three criteria for determining eligibility should apply:

1. The activity is likely to move to another country; and
2. The dominant reason for the move is the cost of complying with the hydrogen target scheme; and
3. Global emissions will increase as a result.

10. Should the Renewable Hydrogen Target for electricity generation consider alternative renewable fuels as eligible for the creation of Renewable Hydrogen Electricity Generation Certificate? Why or why not?

The costs of using other fuels should be tested against hydrogen before a final decision is made.

11. Please consider the benefits, costs and implications of a 1%, 5% and 10% Renewable Hydrogen Target for electricity generation in the SWIS on your business or industry, and provide commentary on how you would expect to react from a commercial and investment perspective to each target level.

No comment.

12. At a whole-of-economy and / or sectoral level, what do you consider to be some of the benefits, costs and implications of a 1% target, a 5% target, and a 10% target?

This would depend on the size of potential exports. Diverting hydrogen to produce 5 per cent of WA's electricity may be a very small amount compared to exports (in which case the role it plays in developing

exports is questionable) or it may be very large (in which case the policy has not succeeded in developing an export industry).

31. Is the suggested approach of a medium term aggregate target, with annual entity targets, an efficient and effective means to achieve the objectives of the Renewable Hydrogen Target for electricity generation in the SWIS? Why or why not?

This approach is consistent with other certificate-based schemes that have operated successfully.

14. To what extent should banking and borrowing of liabilities be permitted under the scheme?

Unlimited banking and limited borrowing generally improves the efficiency of certificate schemes while also ensuring that targets are not at risk of being missed.

15/16. How soon do you believe a Renewable Hydrogen Target for electricity generation in the SWIS could be feasibly delivered from a technical perspective (i.e. if cost was not a consideration)? Similar to the above, how soon do you believe a Renewable Hydrogen Target for electricity generation in the SWIS could be feasibly delivered from a commercial or economic perspective (i.e. if cost was a consideration)?

Australia currently has zero experience of building, commissioning and operating a hydrogen-powered electricity generator. A mandatory scheme will not be feasible without this experience being developed through pilot projects.

17. Over what period of time do you believe is an appropriate ramp up period for the Renewable Hydrogen Target for electricity generation in the SWIS?

The ramp-up should be commensurate with the industry's capacity to supply fuel, build generators and storage; and with a WA Government plan for decarbonising the electricity sector.

85. In the short (<5 years), medium (5-15 years) and long (15+ years) term, where do you expect the cost of production of renewable hydrogen to move from the estimated levels of today? What do you expect to be the drivers of this change?

Currently around three-quarters of the cost of hydrogen production is from electricity consumed. Falling electricity prices are therefore essential to drive down the cost of electricity. However, Australia may find that global competition for renewable energy equipment in the next decade slows progress towards this goal. However, the upside of an accelerated global energy transition in the longer term will be cheaper, larger electrolysers, as the industry scales up faster than previous forecast.

19. To what extent to you believe the above scenarios are reasonable and achievable? Please explain your answer with reference to your previous answers regarding the objectives of the scheme.

No comment,

20/21. How would you expect the levels of hydrogen demand for electricity generation in the SWIS to be met at various points in the supply chain? Would you expect a single generator would emerge and provide all certificates?

This scenario is more likely if the electricity market continues to be dominated by a few players. The incentive would be for each generator

to own its own hydrogen production. The knock-on effect would be very little base from which to build an export industry.

21. Would you expect one very large renewable hydrogen producer, a number of very small renewable hydrogen producers, or some other combination, to emerge in the State as a result of the scheme? Alternatively, would a domestic-focused producer have sufficient scale to operate in a domestic market only?

No comment.

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